

## Plant macrofossil evidence for an early onset of the Holocene summer thermal maximum in northernmost Europe

M. VÄLIRANTA<sup>1\*</sup>, J.S. SALONEN<sup>2</sup>, M. HEIKKILÄ<sup>1</sup>, L. AMON<sup>3</sup>, K. HELMENS<sup>4</sup>, A. KLIMASCHEWSKI<sup>5</sup>, P. KUHR<sup>4</sup>, S. KULTTI<sup>2</sup>, A. POSKA<sup>3,6</sup>, S. SHALA<sup>4</sup>, S. VESKI<sup>3</sup>,  
AND H.H. BIRKS<sup>7</sup>

<sup>1</sup>*Department of Environmental Sciences, ECRU, P.O. Box 65, 00014 University of Helsinki, FINLAND*

*(\*correspondence: minna.valiranta@helsinki.fi)*

<sup>2</sup>*Department of Geosciences and Geography, P.O. Box 64, 00014 University of Helsinki, FINLAND*

<sup>3</sup>*Institute of Geology, Tallinn University of Technology, Ehitajate tee 5, 19086 Tallinn, ESTONIA*

<sup>4</sup>*Department of Physical Geography, Stockholm University 10691 Stockholm, SWEDEN*

<sup>5</sup>*School of Geography, Archaeology and Palaeoecology, Queen's University, Belfast BT7 1NN, UK*

<sup>6</sup>*Department of Physical Geography and Ecosystem Analysis, Lund University, Sölvegatan 12, 22362 Lund, SWEDEN*

<sup>7</sup>*Department of Biology and Bjerknes Centre for Climate Research, University of Bergen, P.O. Box 7803, 5020 Bergen, Norway*

Holocene summer temperature reconstructions from northern Europe based on pollen records suggest an onset of peak summer warmth around 9000 years ago. However, pollen-based temperature reconstructions are largely driven by changes in the proportions of tree taxa and thus the early-Holocene warming signal may be delayed, especially at high latitudes, due to the geographical disequilibrium between climate and tree populations. Here we show that quantitative summer-temperature estimates in northern Europe based on macrofossils of aquatic plants are in many cases ca. 2°C warmer in the early-Holocene (11 700–7500 years ago) than reconstructions based on pollen data. Towards mid-Holocene the reconstructed temperatures converge at all study sites. The modified climate scenario is important for understanding early-Holocene climate changes and for the validation of palaeoclimate model simulations, so that the processes influencing past climate can be better understood, especially during the period of rapid climate change in the early Holocene.

### References:

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